

A Very Speculative Theory of Free Will

Previously: [How Quantum Mechanics is Compatible with Free Will](#)

Attention conservation notice: I am well aware that this post will get me called all sorts of silly names and insults (Penrosian apparently the worst among them). For once, I am not going to respond. I just think the theory ought to be published and if you are not inclined to believe it, then feel free to ignore it.

The big mystery of the mind is reconciling two things: what we know about the physical structures of the brain and what we experience from day to day as conscious people. The first tells us that our brain is made up of a series of interconnected neurons which fire in response to certain inputs. The second tells us that people have subjective unified experiences and at least the appearance of free will. It seems hard to explain how the first can lead to the second, although they're obviously connected somehow.

So, for example, if we're looking at certain visual illusions, we can choose to see them one way or to see them another way. And obviously this choice has some impact on the rest of the brain, especially the part that processes vision. But nobody's been able to find the place in the brain from which such choices originate.

I don't know enough about the subject to vouch for it, but [this article](#) claims that neurons are small enough that we could see quantum effects in their high-level behavior:

The juncture between two neurons is called the synapse. Each of the perhaps 100 billion neurons in the brain is connected to about 1,000 other neurons. At the synapse, a firing neuron either passes a neurochemical signal to the next neuron, or it does not pass a signal, with the passing or not passing depending on the complex neurochemistry of the synapse. If, within a millisecond, a certain number of signals are passed on to a neuron, then that neuron will fire. Otherwise it will not fire. Thus what happens at the various synapses—signal passed on or not passed on—is the sole determinant of the firing pattern of the neurons in the brain. The synapses are the control points for our flow of thoughts.

The synaptic gap, the gap between one neuron and the next, is quite small, 3.5 nanometers, which is about 35 (hydrogen) atoms. The sizes of the adjacent parts of the synapse, where much of the neurochemistry goes on, are also small, on the order of 3,500 atoms wide. Now one of the peculiar effects of quantum mechanics is that if the volume where an atom might be located (the place where the wave function is non-zero) is initially small, it will spread out in time. One can use Heisenberg's uncertainty principle to show that a calcium ion, for example, will spread out to the size of the synapses (not just the synaptic gap) in about .1 milliseconds (see 8 below). Neural processes in the brain occur on a time scale of a millisecond, ten times slower than the spread of a calcium ion over the whole synapse.

So here's the proposal: a series of entangled quantum particles at the synaptic level allow for coordinated firing patterns which occur in response to choices by our conscious free will. Just as my previous post reconciled free will with statistical randomness, this would seem to reconcile free will with the neuroanatomy.

It still seems incredible that there is some high-level coordinated process with its fingers in the quantum effects of our synapses. But we know something incredible is going on because we have subjective experience. So this doesn't seem like much of a stretch to me.

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